



GEORGIA
DEPARTMENT OF
EDUCATION

Kathy Cox, State Superintendent of Schools

**Training for the New Georgia
Performance Standards**

Days 4 and 5: Building Instruction

**Participant's Guide
Mathematics 6th Grade**

We will lead the nation in improving student achievement.



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Acknowledgements

This training program was developed by the Georgia Department of Education as part of a series of professional development opportunities to help teachers increase student achievement through the use of the Georgia Performance Standards.

For more information on this or other GPS training modules, please contact Robin Gower at (404) 463-1933 or rogower@doe.k12.ga.us.

Use of This Guide

The module materials, including a Leader's Guide, Participant's Guide, PowerPoint Presentation, and supplementary materials, are available to designated trainers throughout the state of Georgia who have successfully completed a Train-the-Trainer course offered through the Georgia Department of Education.

Agenda

This is a two-day course, with approximately 11 hours of instructional time.

Prior Preparation—Participants

- Unpack several standards to create Stages 1 and 2 for a unit of study

Introduction to Stage 32 hours

- Quotation Hook
- Review of Stages 1 and 2
- Overview of the Training
- Overview of Stage Three
- Matching Strategies to Achievement Targets

Designing an Instructional Unit.....6 hours

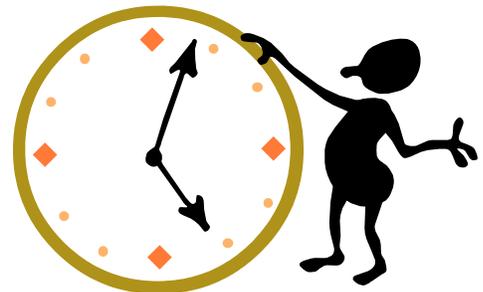
- Hook Activity
- GRASPS Review
- Constructing a Learning Plan
- Designing Units Using Concept Mapping
- Designing Another Unit

Examining Student Work.....2 hours

- Collaborating to Improve the Quality of Student Work
- Developing Useful Teacher Commentary

Curriculum Mapping 1 hour

- Basic Principles of Curriculum Mapping
- Creating a Sample Map



Module Goal

Demonstrate a deep understanding of the new Georgia Performance Standards and the standards-based education approach, through thoughtful curriculum planning, development of formative and summative assessments, and the design of instruction matched to the standards and research-based best practices. This shall be measured by student performance on progress monitoring and standardized criterion-referenced tests.

Key words from the goal:

- Deep understanding
- Georgia Performance Standards (GPS)
- Standards-based education
- Research-based best practices

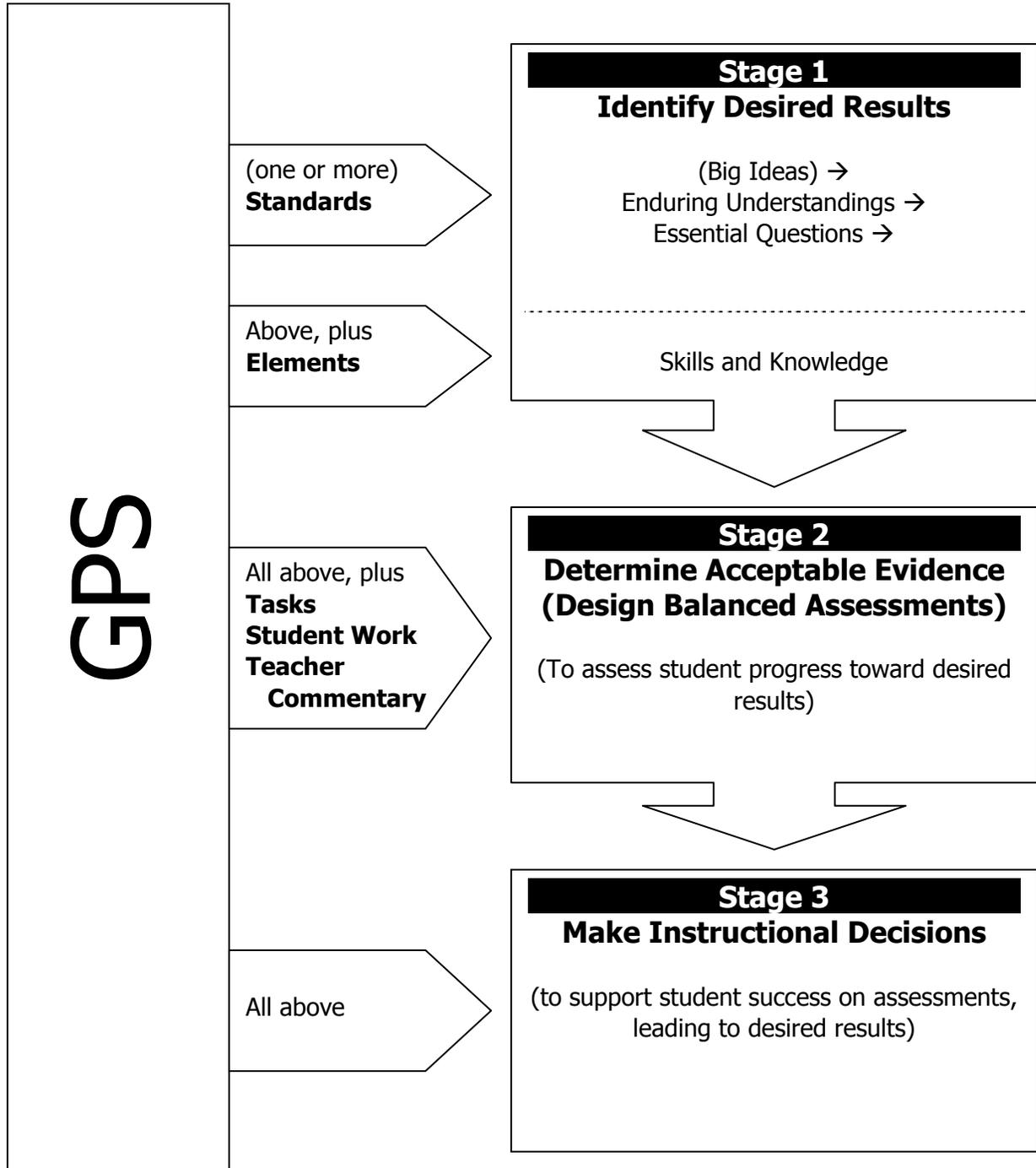
Note that the goal will not be reached by any single day of training. It will take preparation, follow up, and eight days of classroom instruction to master this goal.

Module Objectives

By the end of day five of training, participants will be able to:

1. Explain why designing instruction is Stage 3 in the standards-based education process
2. Describe the WHERETO method of identifying the purpose of instructional strategies.
3. Identify a variety of instructional strategies for different achievement targets.
4. Develop a balanced instructional plan that includes strategies appropriate to achievement targets and content.
5. Describe how to use a structured, collaborative process for examining student work.
6. Demonstrate how to use teacher commentary to increase student learning.
7. Explain different ways of curriculum mapping.

GPS and the Standards-Based Education Process



Teaching for Breadth and Depth

For Depth	Breadth
<p><i>Unearth it</i></p> <ul style="list-style-type: none"> ➤ Make assumptions explicit ➤ Clarify points of view ➤ Bring light to the subtle, the misunderstood, the not obvious, the controversial, the obscure, the problematic, the missing, and the lost. <p><i>Analyze it</i></p> <ul style="list-style-type: none"> ➤ Separate into parts ➤ Inspect and examine ➤ Dissect, refine, and qualify <p><i>Question it</i></p> <ul style="list-style-type: none"> ➤ Test ➤ Challenge ➤ Doubt ➤ Critique <p><i>Prove it</i></p> <ul style="list-style-type: none"> ➤ Argue ➤ Support ➤ Verify ➤ Justify <p><i>Generalize it</i></p> <ul style="list-style-type: none"> ➤ Subsume specifics under a more encompassing idea ➤ Compare and contrast 	<p><i>Connect it</i></p> <ul style="list-style-type: none"> ➤ Link discrete and diverse ideas, facts, and experiences <p><i>Picture it</i></p> <ul style="list-style-type: none"> ➤ Make concrete and simple ➤ Represent or model in different ways <p><i>Extend it</i></p> <ul style="list-style-type: none"> ➤ Go beyond the given to implications ➤ Imagine "what if?"

Adapted from Wiggins, Grant, and Jay McTighe. *Understanding by Design*. ASCD. 1998. 102.

General Categories of Instructional Strategies

Direct Instruction: Instructional strategies that involve a high degree of teacher control.

Compare & Contrast	Explicit Teaching	Reinforcing Effort & Providing Recognition*
Cues, Questions, & Advance Organizers*	Graphic Organizers	Setting Objectives & Providing Feedback*
Demonstrations	Guides for Reading, Listening, Viewing	Summarizing & Note Taking*
Didactic Questions	Identifying Similarities and Differences*	Structured Overview
Drill and Practice	Mastery Lecture	

Experiential Learning: Instructional strategies where students learn by doing or experiencing authentic or simulated situations.

Conducting Experiments	Model Building	Role Playing
Field Observations	Surveys	Games
Field Trips	Modeling	Simulations
	Nonlinguistic Representations*	Synecics

Independent Learning: Instructional strategies during which students work independently, sometimes at their own rate on self-selected assignments or topics.

Assigned Questions	Graphic Organizers	Learning Contracts
Computer Assisted Instruction	Homework and Practice*	Reports
Correspondence Lessons	Learning Activity Package	Research Projects
Essays	Learning Centers	Summarizing and Note Taking*

Indirect Instruction: Instructional strategies where the teacher establishes the learning situation or task, but the students determine the direction and/or solution.

Case Studies	Cloze Procedures	Problem Solving
Concept Attainment	Generating & Testing Hypotheses*	Reading for Meaning
Concept Formation	Graphic Organizers	Reciprocal Teaching
Concept Mapping	Inquiry	Reflective Discussion

Interactive Instruction: Instructional strategies that involve students working with other students and/or the teacher to move toward the learning goals.

Brainstorming	Interviewing	Problem Solving
Circle of Knowledge	Laboratory Groups	Role Playing
Cooperative Learning*	Panels	Socratic Seminars
Debates	Peer Practice	Tutorial Groups

* Marzano, Pickering, and Pollock note that incorporating these nine strategies into instruction can improve student achievement across all content areas and grade levels. <http://www.learn-line.nrw.de/angebote/greenline/lernen/downloads/nine.pdf>

Matching Instructional Formats to Achievement Targets

	Direct Instruction	Experiential Learning	Independent Learning	Indirect Instruction	Interactive Instruction
Knowledge/ Information	Strategies such as direct instruction, graphic organizers, structured overview, etc., can convey facts or information to students.	Experiential strategies may be structured to allow students to arrive, inductively or deductively, at rules or principles.	Strategies such as assigned questions, learning activity packages or centers, reports, or research projects allow students to obtain facts, etc.	Strategies such as concept attainment or concept formation, reading for meaning, reciprocal teaching, and inquiry allow students to arrive at rules or principles.	Strategies such as discussion, interviewing, or tutorial groups can provide students with information or help them to review rules, etc.
Skills/ Processes	Modeling can introduce or demonstrate skills or processes, but other, more student-directed strategies are needed as well.	Modeling, games, conducting experiments, etc., can introduce skills/processes or provide practice.	Essays, learning activity packages or centers, or research projects, etc., can provide opportunities for application or practice.	Instructional strategies that involve problem solving often provide the opportunity to acquire skills or practice processes.	Cooperative learning groups, debates, role playing, or laboratory groups, etc., work well.
Thinking & Reasoning	Modeling can introduce or demonstrate thinking and reasoning processes, but other, more student-directed strategies are needed as well.	Most experiential strategies work well here, especially roll playing, games, experiments, and simulations.	Some, such as certain essay topics, learning activity packages or centers, or research projects, work better than others.	Strategies such as working with case studies, concept mapping, inquiry, problem solving, etc., work well with thinking and reasoning targets.	Most interactive instructional strategies work with these targets, but especially problem solving and Socratic Seminars.
Communication	Not the best strategies for providing students with opportunities to acquire or practice communication skills.	Good when oral, written, or other forms of expression are included, such as reporting field observations, role playing, or simulations.	Again, essays or other strategies that involve oral, written, or other forms of expression can provide the opportunity to learn communication skills.	Reciprocal teaching, reflective discussion, or other strategies that involve oral, written, or other forms or expression work well.	By definition, interactive instructional strategies include opportunities to learn or practice communication skills.

Georgia Mathematics Performance Standards: Grade 6

By the end of grade six, students will understand the four arithmetic operations as they relate to positive rational numbers; convert between and compute with different forms of rational numbers; understand the concept of ratio and solve problems using proportional reasoning; understand and use line and rotational symmetry; determine the surface area and volume of solid figures; use variables to represent unknown quantities in formulae, algebraic expressions and equations; utilize data to make predictions; and determine the probability of a given event.

Instruction and assessment should include the use of manipulatives and appropriate technology. Topics should be represented in multiple ways including concrete/pictorial, verbal/written, numeric/data-based, graphical, and symbolic. Concepts should be introduced and used in the context of real world phenomena.

Concepts/Skills to Maintain

Operations with decimal fractions

Addition and subtraction of common fractions and mixed numbers with unlike denominators such as 2, 3, 4, 5, 6, 8, 10 and 12.

Modeling multiplication of common fractions

Modeling percent

Graphing data

Multiples and factors

Perimeter, capacity and area of geometric figures

Evaluating algebraic expressions

NUMBER AND OPERATIONS

Students will understand the meaning of the four arithmetic operations as related to positive rational numbers and will apply these concepts and associated skills in real world situations.

M6N1. Students will understand the meaning of the four arithmetic operations as related to positive rational numbers and will use these concepts to solve problems.

- a. Apply factors and multiples.
- b. Decompose numbers into their prime factorization (Fundamental Theorem of Arithmetic).
- c. Determine the greatest common factor (GCF) and the least common multiple (LCM) for a set of numbers.
- d. Add and subtract fractions and mixed numbers with unlike denominators.
- e. Multiply and divide fractions and mixed numbers.
- f. Use fractions, decimals, and percents interchangeably.
- g. Solve problems involving fractions, decimals, and percents.

MEASUREMENT

Students will understand how to determine the volume and surface area of solid figures. They will understand and use the customary and metric systems of measurement to measure quantities efficiently and to represent volume and surface area appropriately.

M6M1. Students will convert from one unit to another within one system of measurement (customary or metric) by using proportional relationships.

M6M2. Students will use appropriate units of measure for finding length, perimeter, area and volume and will express each quantity using the appropriate unit.

- a. Measure length to the nearest half, fourth, eighth and sixteenth of an inch.
- b. Select and use units of appropriate size and type to measure length, perimeter, area and volume.
- c. Compare and contrast units of measure for perimeter, area, and volume.

M6M3. Students will determine the volume of fundamental solid figures (right rectangular prisms, cylinders, pyramids and cones).

- a. Determine the formula for finding the volume of fundamental solid figures.
- b. Compute the volumes of fundamental solid figures, using appropriate units of measure.
- c. Estimate the volumes of simple geometric solids.
- d. Solve application problems involving the volume of fundamental solid figures.

M6M4. Students will determine the surface area of solid figures (right rectangular prisms and cylinders).

- a. Find the surface area of right rectangular prisms and cylinders using manipulatives and constructing nets.
- b. Compute the surface area of right rectangular prisms and cylinders using formulae.
- c. Estimate the surface areas of simple geometric solids.
- d. Solve application problems involving surface area of right rectangular prisms and cylinders.

GEOMETRY

Students will further develop their understanding of plane and solid geometric figures, incorporating the use of appropriate technology and using this knowledge to solve authentic problems.

M6G1. Students will further develop their understanding of plane figures.

- a. Determine and use lines of symmetry.
- b. Investigate rotational symmetry, including degree of rotation.
- c. Use the concepts of ratio, proportion and scale factor to demonstrate the relationships between similar plane figures.
- d. Interpret and sketch simple scale drawings.
- e. Solve problems involving scale drawings.

M6G2. Students will further develop their understanding of solid figures.

- a. Compare and contrast right prisms and pyramids.
- b. Compare and contrast cylinders and cones.
- c. Interpret and sketch front, back, top, bottom and side views of solid figures.
- d. Construct nets for prisms, cylinders, pyramids, and cones.

ALGEBRA

Students will investigate relationships between two quantities. They will write and solve proportions and simple one-step equations that result from problem situations.

M6A1. Students will understand the concept of ratio and use it to represent quantitative relationships.**M6A2. Students will consider relationships between varying quantities.**

- a. Analyze and describe patterns arising from mathematical rules, tables, and graphs.
- b. Use manipulatives or draw pictures to solve problems involving proportional relationships.
- c. Use proportions ($a/b=c/d$) to describe relationships and solve problems, including percent problems.
- d. Describe proportional relationships mathematically using $y = kx$, where k is the constant of proportionality.
- e. Graph proportional relationships in the form $y = kx$ and describe characteristics of the graphs.
- f. In a proportional relationship expressed as $y = kx$, solve for one quantity given values of the other two. Given quantities may be whole numbers, decimals, or fractions. Solve problems using the relationship $y = kx$.
- g. Use proportional reasoning ($a/b=c/d$ and $y = kx$) to solve problems.

M6A3. Students will evaluate algebraic expressions, including those with exponents, and solve simple one-step equations using each of the four basic operations.

DATA ANALYSIS AND PROBABILITY

Students will demonstrate understanding of data analysis by posing questions to be answered by collecting data. They will represent, investigate, and use data to answer those questions. Students will understand experimental and theoretical probability.

M6D1. Students will pose questions, collect data, represent and analyze the data, and interpret results.

- a. Formulate questions that can be answered by data. Students should collect data by using samples from a larger population (surveys), or by conducting experiments.
- b. Using data, construct frequency distributions, frequency tables, and graphs.
- c. Choose appropriate graphs to be consistent with the nature of the data (categorical or numerical). Graphs should include pictographs, histograms, bar graphs, line graphs, circle graphs, and line plots.
- d. Use tables and graphs to examine variation that occurs within a group and variation that occurs between groups.
- e. Relate the data analysis to the context of the questions posed.

M6D2. Students will use experimental and simple theoretical probability and understand the nature of sampling. They will also make predictions from investigations.

- a. Predict the probability of a given event through trials/simulations (experimental probability), and represent the probability as a ratio.
- b. Determine, and use a ratio to represent, the theoretical probability of a given event.
- c. Discover that experimental probability approaches theoretical probability when the number of trials is large.

Terms/Symbols: positive rational numbers, factors, multiples, decompose, prime numbers, prime factorization, Fundamental Theorem of Arithmetic, GCF, LCM, evaluate, surface area, metric system of measurement, customary system of measurement, proportional relationships, right rectangular prism, cylinder, pyramid, cone, geometric solid, net, geometric figures, line symmetry, rotational symmetry, similar plane figures, scale factor, scale drawings, relations, varying quantities, ratio, direct proportion, proportions, proportional reasoning, frequency distributions, pictographs, histograms, bar graphs, line graphs, circle graphs, line plot, frequency table, experimental probability, theoretical probability, sampling, event, random sample, population, non-routine word problems

Process Standards

Each topic studied in this course should be developed with careful thought toward helping every student achieve the following process standards.

M6P1. Students will solve problems (using appropriate technology).

- a. Build new mathematical knowledge through problem solving.
- b. Solve problems that arise in mathematics and in other contexts.
- c. Apply and adapt a variety of appropriate strategies to solve problems.
- d. Monitor and reflect on the process of mathematical problem solving.

M6P2. Students will reason and evaluate mathematical arguments.

- a. Recognize reasoning and proof as fundamental aspects of mathematics.
- b. Make and investigate mathematical conjectures.
- c. Develop and evaluate mathematical arguments and proofs.
- d. Select and use various types of reasoning and methods of proof.

M6P3. Students will communicate mathematically.

- a. Organize and consolidate their mathematical thinking through communication.
- b. Communicate their mathematical thinking coherently and clearly to peers, teachers, and others.
- c. Analyze and evaluate the mathematical thinking and strategies of others.
- d. Use the language of mathematics to express mathematical ideas precisely.

M6P4. Students will make connections among mathematical ideas and to other disciplines.

- a. Recognize and use connections among mathematical ideas.
- b. Understand how mathematical ideas interconnect and build on one another to produce a coherent whole.
- c. Recognize and apply mathematics in contexts outside of mathematics.

M6P5. Students will represent mathematics in multiple ways.

- a. Create and use representations to organize, record, and communicate mathematical ideas.
- b. Select, apply, and translate among mathematical representations to solve problems.
- c. Use representations to model and interpret physical, social, and mathematical phenomena.

Reading Standard Comment

After the elementary years, students are seriously engaged in reading for learning. This process sweeps across all disciplinary domains, extending even to the area of personal learning. Students encounter a variety of informational as well as fictional texts, and they experience text in all genres and modes of discourse. In the study of various disciplines of learning (language arts, mathematics, science, social studies), students must learn through reading the communities of discourse of each of those disciplines. Each subject has its own specific vocabulary, and for students to excel in all subjects, they must learn the specific vocabulary of those subject areas *in context*.

Beginning with the middle grades years, students begin to self-select reading materials based on personal interests established through classroom learning. Students become curious about science, mathematics, history, and literature as they form contexts for those subjects related to their personal and classroom experiences. As students explore academic areas through reading, they develop favorite subjects and become confident in their verbal discourse about those subjects.

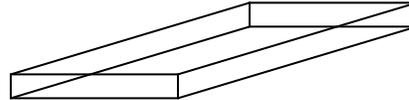
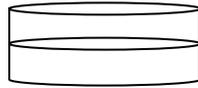
Reading across curriculum content develops both academic and personal interests in students. As students read, they develop content and contextual vocabulary. They also build good habits for reading, researching, and learning. The Reading Across the Curriculum standard focuses on the academic and personal skills students acquire as they read in all areas of learning.

MRC. Students will enhance reading in all curriculum areas by:

- a. Reading in All Curriculum Areas
 - Read a minimum of 25 grade-level appropriate books per year from a variety of subject disciplines and participate in discussions related to curricular learning in all areas
 - Read both informational and fictional texts in a variety of genres and modes of discourse
 - Read technical texts related to various subject areas
- b. Discussing books
 - Discuss messages and themes from books in all subject areas.
 - Respond to a variety of texts in multiple modes of discourse.
 - Relate messages and themes from one subject area to messages and themes in another area.
 - Evaluate the merit of texts in every subject discipline.
 - Examine author's purpose in writing.
 - Recognize the features of disciplinary texts.
- c. Building vocabulary knowledge
 - Demonstrate an understanding of contextual vocabulary in various subjects.
 - Use content vocabulary in writing and speaking.
 - Explore understanding of new words found in subject area texts.
- d. Establishing context
 - Explore life experiences related to subject area content.
 - Discuss in both writing and speaking how certain words are subject area related.
 - Determine strategies for finding content and contextual meaning for unknown words.

GPS Mathematics Grade 6 Sample Task

- a) Explain what is meant by surface area. What steps would you take to find the surface area of a cylinder?
- b) One of the major expenses in manufacturing a can is the amount of metal that goes into it. How many square centimeters of metal would be required to manufacture a can that has a diameter of 8 cm and a height of 20 cm? Estimate and then solve.
- c) Draw a net (pattern) for the manufacturer to use to make the can.
- d) Use your work in parts a – c to write a rule in words for finding the surface area of a cylinder. Now write your rule using letters, numbers, and mathematical symbols (a formula).
- e) Michael bakes a round two-layer birthday cake that is to be covered with frosting on the top, sides, and in between the layers. Each layer has a height of 4 cm and diameter of 24 cm. The label on the can of frosting he bought claims that the contents will cover the top and sides of a one-layer rectangular sheet cake that is 32 cm by 22 cm by 4 cm. Will Michael have enough frosting? Show how you know.



Mathematics Grade 6 Sample Unit Plan: Surface Area

Stage 1- Desired Results	
<p>Established Goals:</p> <p>M6M4: Students will determine the <u>surface area</u> of <u>solid figures</u> (<u>right prisms</u> and <u>cylinders</u>).</p> <ol style="list-style-type: none"> Find the <u>surface area</u> of a right prism and cylinder using <u>manipulatives</u> and constructing <u>nets</u>. Compute the surface area of a right prism and cylinder using <u>formulae</u>. <u>Estimate</u> the surface area of a <u>simple geometric solid</u>. Solve application problems involving surface area of right prisms and cylinders. <p>M6P1. Students will solve problems (using appropriate technology).</p> <p>M6P2. Students will reason and evaluate mathematical arguments.</p> <p>M6P3. Students will communicate mathematically.</p> <p>M6P4. Students will make connections among mathematical ideas and to other disciplines.</p> <p>M6P5. Students will represent mathematics in multiple ways.</p>	
<p>Understandings: Students will understand that...</p> <ul style="list-style-type: none"> Formulas for calculating surface area are derived from the areas of plane figures. Using nets and creating mathematical models help us to derive and illustrate surface area formulas. Solids have both surface area and volume. The surface area of a solid is the total area (the sum) of the areas of all its faces. The volume of a solid is the measure of the amount of space the solid occupies. 	<p>Unit Essential Questions</p> <ul style="list-style-type: none"> How are the formulas for calculating the surface area of right prisms and cylinders derived from the areas of plane figures and how can nets be used to illustrate this? How would you compare and contrast surface area and volume?
<p>Knowledge: Students will know...</p> <ul style="list-style-type: none"> The definitions of right rectangular prism, right cylinder, volume, surface area, and net Formulas for surface area of a cylinder and a right rectangular prism (if you want students to memorize these) 	<p>Skills: Students will be able to ...</p> <ul style="list-style-type: none"> Find the surface area of a right prism and cylinder using manipulatives and constructing nets. Derive formulas for the surface areas of right rectangular prisms and cylinders using areas of rectangles and circles. Compute the surface area of right rectangular prisms and cylinders using formulae. Estimate the surface area of a simple geometric solid. Solve application problems involving surface area of right rectangular prisms and cylinders.

Stage 2-Assessment Evidence**Performance Tasks**

1. GRASPS

Goal: Determine the most efficient package to use for shipping a single softball.

Role: You are an industrial engineer for ABC Softball Company.

Audience: The target audience is the shipping manager of ABC Softball Company.

Situation: Your company ships out souvenir softballs one at a time. The shipping manager has told you to determine whether a tube or a box would be the most efficient way to send the individual softballs.

Product Performance and Purpose: Manufacturers design efficient packages that are the right size for their products. The less wasted volume in a package, the more money a company saves. Packaging material is expensive, and it usually ends up in a landfill or a recycling plant. Therefore, reducing the amount of material required is good economics and good for the environment.

You will need to construct two types of packaging for a softball. One package has the shape of a prism. The other has the shape of cylinder or a tube. You will construct the minimum size of each package for a softball. You will also determine which of the two types of packages uses less material.

Calculate and record the surface areas of the box and tube. Put the ball in the box and then in the tube. Does the ball fit in both containers with little wasted space? Which container uses less material, the box or the tube? Why? If you use the container with the smallest surface area to package 100,000 softballs, how many square centimeters of packaging material will you save over the other container? If you ship X softballs, how much would you save?

Standards and Criteria for Success: Your presentation materials should include the tube and box that you constructed as well as the net that you used to construct them. Also, you should include a written report that addresses the following:

- type of container that you recommend;
- surface area of each of your containers including your calculations;
- information regarding how much your company would save by using your container if 100,000 individual softballs were sent;
- copy of Excel or other spreadsheet showing how much money your company would save by using your container for any given number of softballs shipped.

2. Given a right rectangular prism (box), use centimeter grid paper to make at least three nets to form the box. Test each paper net by cutting it out and wrapping it around the box. Then write descriptions for your nets.
3. Carly is a packaging designer for a cereal manufacturer. When she designs a new cereal box, she must report the amount of material that will be required to make the box. What amount should Carly report for the design shown? Show how you determined your amount and explain your process. Use illustrations to support your justifications.
4. Use tasks listed in the Grade 6 Mathematics GPS.

Other Evidence**Academic Prompts:**

- How can we use nets to derive the formula for surface area of any solid figure?
- What is the relationship between a solid figure and its surface area?
- How might the surface area be found given the volume of a solid figure?
- Explain how changing the dimensions of a solid figure affect the surface area.
- Suppose the radius and height of a cylinder are given in centimeters. What is the most convenient unit for the surface area of the cylinder?
- Make a conjecture about the ratio of the surface areas of two similar solids. Make a conjecture about the ratio of the volumes of two similar solids.
- Compare and contrast surface area and volume.

Quiz and Test Items:

1. Given that the volume of a cube is 64 cubic centimeters, find the surface area and construct the net and solid.
2. Provided some solid figures, find the surface area.
3. Develop four problems on surface area where one answer choice is correct, one answer choice is a common mistake/misunderstanding, and one answer choice is just wrong. Be sure to illustrate and support each answer choice.
4. Given a figure (pairs of students will have different solid figures), explain in writing how you would help a friend determine how much wrapping paper is needed to cover the entire figure without overlapping. Now, exchange papers with your pair partner and provide your classmate with feedback on the process. Refer to the standard and elements as you provide detailed feedback and utilize illustrations and detailed work to support your commentary.
5. Let l be the length, w the width, and h the height of a rectangular prism. Show that the surface area of the prism can be found with this formula.
Surface Area = $2lw + 2lh + 2wh$.

Informal Checks for Understanding:

- Frequently throughout the unit, use the 3-2-1 summarizing strategy. For example, ask the students to answer the following three questions and turn them in as they leave the room.
 1. List 3 things that you have learned about determining the surface area of prisms and cylinders.
 2. If you were the teacher of this class next year, what two things would you do to ensure that the students truly understand surface area?
 3. Estimate the surface area of (some object in your classroom).
- Everyday as students work on their math assignments, monitor student progress by walking around the room and examining each individual's (or group's) work to identify misunderstandings.
- Monitor as students summarize while participating in inside-outside circle cooperative learning structure.
- Use student-generated Maps on the Wall created before the test and left up during the test.

Stage 3-Learning Plan

Consider the WHERETO elements.

W = Students: **Where** the unit is going, **What** is expected (goals, expectations, relevance/value);

Teacher: **Where** the students are coming from (diagnosis)

H = **Hook** students, **Hold** their interest

E = **Equip** students, **Experience** key ideas, **Explore** the issues

R = **Rethink**, **Reflect**, **Revise**, **Rehearse**, **Revisit**, **Refine**

E = Students **Evaluate** their own work

T = **Tailored** (to needs, interests, abilities of learners) and flexible
(differentiation – content, process, product)

O = **Organized** and sequenced (to maximize engagement, effective learning)

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Mathematics Grade 6 Sample Unit Plan:

Stage 1- Desired Results	
Established Goals:	
Understandings: Students will understand that...	Unit Essential Questions
Knowledge: Students will know...	Skills: Students will be able to ...

Stage 2-Assessment Evidence

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Stage 3-Learning Plan

Consider the WHERETO elements.

W = Students: **Where** the unit is going, **What** is expected (goals, expectations, relevance/value);

Teacher: **Where** the students are coming from (diagnosis)

H = **Hook** students, **Hold** their interest

E = **Equip** students, **Experience** key ideas, **Explore** the issues

R = **Rethink**, **Reflect**, **Revise**, **Rehearse**, **Revisit**, **Refine**

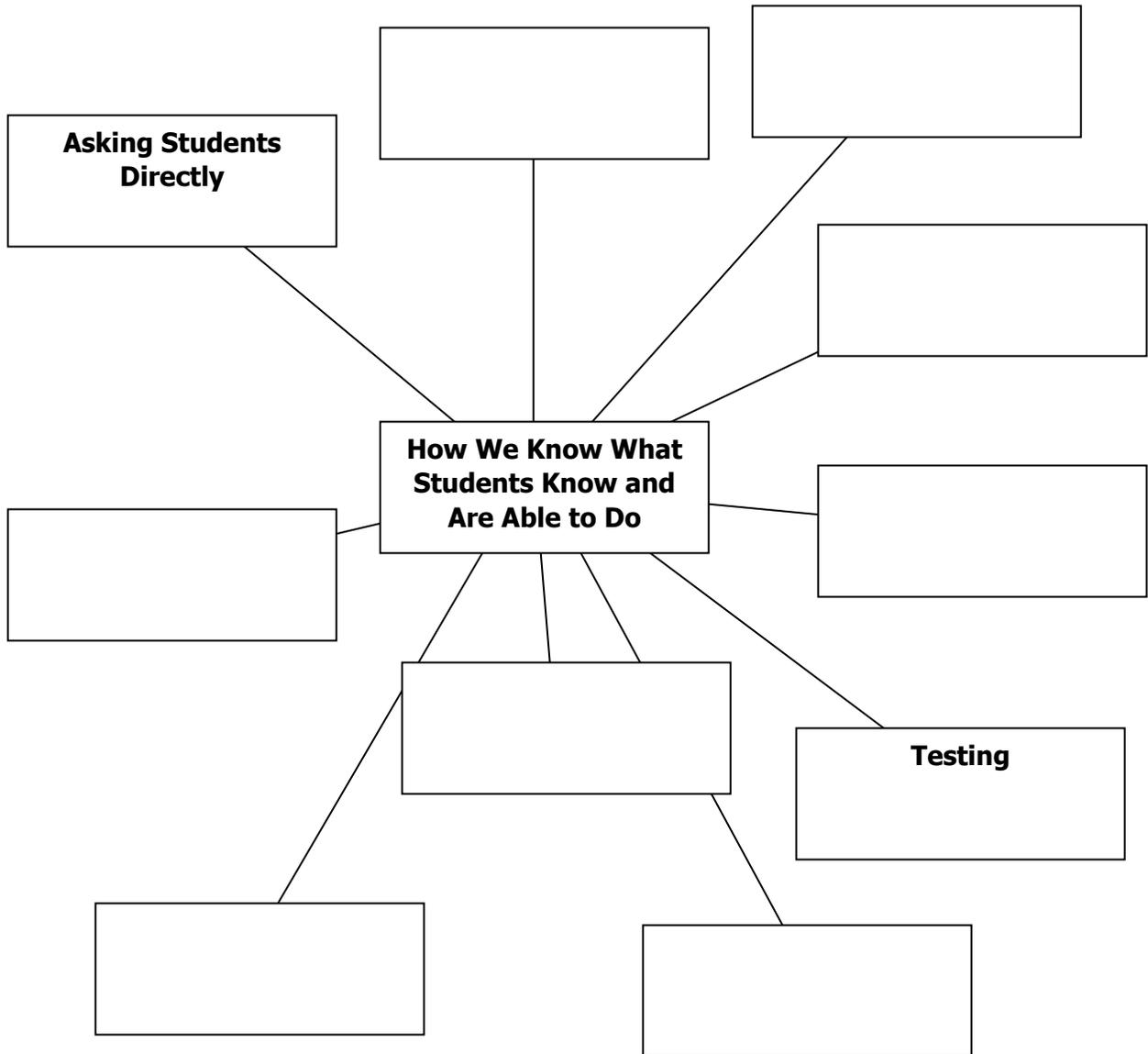
E = Students **Evaluate** their own work

T = **Tailored** (to needs, interests, abilities of learners) and flexible
(differentiation – content, process, product)

O = **Organized** and sequenced (to maximize engagement, effective learning)

How We Know What Students Know and Are Able to Do

Identify ways we know what students know and are able to do. Use the map below to show relationships among the different methods.



From the Association for Supervision and Curriculum Development (ASCD).

Tuning Protocol Information

The tuning protocol was originally developed as a means for the five high schools in the Coalition of Essential Schools Exhibitions Project to receive feedback and fine-tune their developing student assessment systems, including exhibitions, portfolios and design projects. Recognizing the complexities involved in developing new forms of assessment, the project staff developed a facilitated process to support teachers in sharing their students' work and, with colleagues, reflecting upon the lessons that are embedded there. This collaborative reflection helps teachers design and refines their assessment systems, as well as support higher quality student performance. Since its trial run in 1992, the tuning protocol has been widely used and adapted for professional development purposes in and among schools across the country.

To take part in the tuning protocol, teachers bring samples of their students' work on paper and, whenever possible, on video, as well as some of the materials they have created to support student performance, such as assignment descriptions and scoring rubrics. Choose student work that can be viewed or read or listened to by all participants during the allotted presenter time. For written work, you should have a copy for all participants. This could include:

- Any written form (essay, creative writing, test, portfolio, etc.)
- A performance, interview, presentation, or demonstration on videotape or audio tape
- A piece of art in any form
- A multimedia presentation
- A display

In addition, you may choose to present:

- One piece from one student
- One piece from several students
- Multiple pieces from the same student
- Drafts of a single piece from a single student over time

In a circle of about eight to 12 "critical friends" (usually other teachers), a facilitator guides the group through the process and keeps time. The **presenting teacher**, or team of teachers, describes the context for the student work (the task or project), uninterrupted by questions or comments from participants.

Usually, the presenting teacher begins with a focus question or area about which she would especially welcome feedback, such as, "Are you seeing evidence of persuasive writing in the student's work?" Participants have time to examine the student work and ask clarifying questions. Then, with the presenting teacher listening but silent, participants offer "warm" (positive and supportive) and "cool" (more critical and challenging) feedback. Teachers

sometimes frame their feedback as a question, for example, "How might the project be different if students chose their research topic?"

After this feedback is offered, the presenting teacher has the opportunity, again, uninterrupted, to reflect on the feedback and address any comments or questions she chooses. Time is reserved for debriefing the experience. Both presenting and participating teachers have found the tuning experience to be a powerful stimulus for encouraging reflection on their practice. A schedule for a tuning protocol appears on the following pages. The schedule can be revised to meet the needs of different groups of teachers.

Tuning Protocol Steps

1. Introduction (10 minutes)

- Facilitator briefly introduces protocol goals, guidelines and schedule.
- Participants briefly introduce themselves (if necessary).

2. Presentation (20 minutes)

- Teacher presents the assignment context (what the students tend to be like, where they are in school, where they are in the year), goals, samples and assessment strategy.
- Teacher-presenter poses a question for the group.
- Participants are silent.

3. Clarifying Questions (5 minutes max)

- Clarifying questions concern matters of fact ("How many students will you have in this class?", "What kind of prior experience in this subject can you count on?"). The facilitator judges which questions more properly belong in warm/cool feedback.

4. Examination of Work (15 minutes)

- Participants look at the work, take notes on where it seems "in tune" with goals and where there might be problems; and (if appropriate, see feedback section) write down warm and cool feedback, as well as probing questions. Participants focus particularly on the presenter's question.

5. Pause to Reflect on Warm and Cool Feedback (2 - 3 minutes max)

- Participants may take a couple of minutes to reflect on what they would like to contribute to the feedback session.

6. Warm and Cool Feedback (15 minutes)

- Teacher-presenter remains silent.
- Participants share feedback. They begin with ways in which the work seems to meet the goals, and continue with possible disconnections and problems. These don't need to be in tight sequence, but participants should always begin with some positive feedback.
- Some groups prefer to structure the session by beginning with 5 minutes of "warm" or positive feedback ("What are the strengths here?"), followed by 5 minutes of "cool" or more critical feedback ("Where are the gaps?", "What are the problems here?"), and ending with 5 minutes of "probing" or reflective questions for the five presenting teachers to consider.
- The facilitator may need to remind the participants of the presenter's focusing question.

7. Reflection (5 minutes)

- Teacher-presenter speaks to those comments and questions he or she chooses while participants are silent. This is NOT a time to defend oneself, but a time to explore further interesting ideas that have come out of the feedback section.
- Facilitator may intervene to focus or clarify.

8. Debrief (5 minutes)

- Facilitator-led open discussion of this tuning experience.

Tuning Protocol Guidelines

Participation in a structured process of professional collaboration like this can be intimidating and anxiety-producing, especially for the teacher presenting student work. Having a shared set of guidelines or norms helps everybody participate in a manner that is respectful, as well as conducive to helpful feedback. Below is one set of guidelines; teachers may want to create their own. In any case, the group should go over the guidelines and the schedule before starting the protocol. The facilitator should feel free to remind participants of the guidelines and schedule at any time in the process.

1. ***Be respectful of presenters.*** By making their work more public, teachers are exposing themselves to kinds of critiques they may not be used to receiving. If inappropriate comments or questions are posed, the facilitator should make sure they are blocked or withdrawn.
2. ***Be respectful of students and their work.***
3. ***Contribute to substantive discourse.*** Resist offering only blanket praise or silence. Without thoughtful, probing questions and comments, the presenter will not benefit from the tuning protocol.
4. ***Be appreciative of the facilitator's role, particularly in regard to following the guidelines and keeping time.*** A complete format is run on a tight schedule. A tuning protocol that doesn't allow for all components (presentation, feedback, response, debrief) to be enacted properly will do a disservice to the teacher-presenters and to the participants. Try to keep your comments succinct, and monitor your own air time.
5. ***Facilitators need to keep the conversation constructive.*** There is a delicate balance between feedback that only strokes and feedback that does damage. It is the facilitator's job to make sure balance is maintained. At the end of the session, the presenter should be able to revise the work productively on the basis of what was said.
6. ***Don't skip the debrief.*** It is tempting to move to the next item of business once the feedback section is over. If you do that, the quality of responses will not improve and the presenters will not get increasingly useful kinds of feedback.

Source: A Guide to Looking Collaboratively at Student Work by David Allen, Tina Blythe, Barbara Powell

The Standards in Practice™ Model for Examining Student Work

- 1** We all complete the assignment or task.
- 2** We analyze the demands of the assignment or task.
- 3** We identify the standards that apply to this assignment.
- 4** We generate a rough rubric or scoring guide for this assignment from the standards and the assignment.
- 5** We score the student work, using the rubric/scoring guide.
- 6** We analyze student work to plan strategy for improving students' performance. Then we look at actions needed at the classroom, school, and district levels, to ensure that all students meet the standards on this and similar assignments.

The Standards in Practice model was developed by EdTrust, and the instructional materials included here were developed by the Southern Regional Education Board.

Standards in Practice™ Step 1

Complete the assignment that the students were asked to do.

■ Procedures

Ask the teacher bringing the assignment:

- Why did you give the students this assignment?
- What instructions did the students get? Oral? Written and distributed to each student?
- Do we have the same instructions as the students? Were they on the board?

Give participants 10 minutes to do the assignment, telling them that they can do it in any way that they want—collaboratively, individually, with or without calculators.

Hand out the assignment sheets and then walk around the tables, answering questions, encouraging, providing hints.

■ Guidelines

This is the only step with a time limit. The other steps can take as much time as is available (for example, during a two-hour or a one-day demonstration, or a one-hour team meeting), provided that there is sufficient time for a discussion in Step 6. It is so important NOT to spend too much time on Step 1 that we would suggest combining Step 1 and Step 2, if necessary. The instructors could ask the participants to work through the assignment as a whole group instead of individually, and then immediately ask the questions in Step 2.

If there is time for the groups to do the assignment completely, the participants should be asked to compare how they approached it. If there are wide differences in how they answered the question, that fact should be noted as a subject for revision in Step 6: if adults can interpret an assignment in widely different ways, students can do so too and probably get a poor grade for misunderstanding an intention that wasn't clear.

Do not provide instructions orally unless this is an assignment for very young students. Tell participants that they must use the instructions printed on the assignment.

■ Key Points

Do this fast, but do it! If you don't do the assignment yourselves, you won't know whether it truly asks for the knowledge and skills you want students to have.

Students can get poor grades because they didn't hear all of the assignment because the teacher gave it orally, or part of the assignment can be erased from the board. We suggest that students receive assignments in clear written form beginning in first grade, and that teachers are careful to see that all students have understood what is wanted.

Word to the wise: You can't always do the assignment a teacher brings. The assignment may be too long, may require scissors and paste (elementary school), or a science lab (high school). The teacher bringing the assignment should explain how it was presented to students, where in the unit or semester it came, and what the intention was.

Standards in Practice™ **Step 2**

Analyze the demands of the assignment or task.

■ Procedures

This activity should be done as a whole group. The instructors use chart paper to list the major skills and knowledge that the students must have if they are going to do well on the assignment. Ask teachers to work in groups to analyze the requirements of the assignment or task:

- What skills and knowledge are needed to complete it?
- Does it require problem-solving? Computation? Knowledge of literary forms such as fairy tales? Writing? Reading comprehension? Editing?

If no content can be found, go immediately to Step 6.

■ Guidelines

The major question for the group to focus on is: Why was this assignment given? What academic content did the student have to know to complete the assignment? Assignments are assessments of what the student has learned, so teachers have to be able to articulate the skills and knowledge that the student should demonstrate in completing a specific assignment.

The focus must be on academic skills and knowledge, not process or motivation. Was there anything to learn in this assignment? An assignment teaching only “following instructions” or “research skills,” for example, should not be considered further. Instead of trying to look for standards that won't be there, the group should move immediately to Step 6 and suggest modifications for the assignment: Following instructions to do what? Research into what topic?

■ Key Points

Teachers must know why they have given students an assignment, in terms of academic content; they should examine the assignment thoroughly to identify exactly what it asks students to do. *What does the student have to know and be able to do in order to complete the assignment? (Content and skills, not process or motivation.)*

Standards in Practice™ Step 3

Identify the standards that apply to this assignment.

■ Procedures

1. Gather the related Georgia Performance Standards (e.g., grade 4 mathematics).
2. Ask, “If the students do this assignment, what standards would they be moving toward?”
3. The team members find standards that the assignment is aligned with and write them down. As the facilitator writes the standards on the chart paper at the front of the room, she will ask the participants not to call out the number of the standard, except for reference, but instead to read the complete text and then choose key words for the chart. We do this because it requires participants to examine the wording of the standards, to learn what's in the standards.

■ Guidelines

Don't make enormously long lists of standards. Most assignments don't address more than two or three standards. Look at the assignment and figure out the central learning that it embodies. Remember that many assignments will include writing as well as other content, so you should choose a writing standard in addition to the main content.

Step 3, like Step 2, is often a new experience for teachers. They may have been used to writing a few numbers by each assignment and calling that alignment with the standards, but we insist that they look hard at what each standard says and ask whether this assignment would help a student to attain that knowledge or skill.

■ Key Points

- All assignments must be aligned with the standards used in the state.
- Find as few standards as necessary to cover all the cognitive demands listed in Step 2.
- Quote the actual language of the standards, not the numerical designation. Examine standards thoroughly for their meaning.
- If no standards can be found, proceed immediately to Step 6.

Standards in Practice™ **Step 4**

Using the standards and the assignment, develop a rubric or scoring guide for this assignment.

■ Procedures

In Step 4, participants construct a scoring rubric for the student work.

1. Set level 4: First, describe "ideal" work—the best possible answer. This would be level 4.
2. Set level 3: Next, describe a "perfectly adequate" answer. This is a level 3. It is fairly simple to do this by subtracting qualities from the "4" description—an excellent reason for starting at the top. A "3" will have the elements of a sound answer (correct answer, explanation), but will lack the brilliance of a "4": the explanation will not be easy to follow, for example.
3. Set levels 2 and 1: Describe work that requires reteaching, due to a basic lack of understanding. A level 2 would be deficient in at least one key area, and a level 1 would be deficient in additional key areas.

■ Guidelines

To make clear what a task-specific rubric looks like, you may present a model to people who have never constructed one. You can use the “dots” rubric for this purpose. Using a model involves the danger of having people slavishly follow it, which can result in irrelevant criteria. If you show a model to the participants, make sure it isn't a rubric for the same problem as you're using to demonstrate and that people understand that the features of a model must be transferred to a new situation, not just copied.

■ Key Points

Being clear about expected quality ensures equity and fairness for students. The purpose of Step 4 is:

1. To make the quality of expected work explicit, and thus to raise student achievement by making the features of excellent work clear to everyone concerned—teachers, students, parents, future employers.
2. To make scoring equitable by making the criteria public.
3. To make clear how a standards-based system works in contrast to a norm-referenced system. In a norm-referenced system, students' work is compared to other students' work. The best usually get the highest score, regardless of their absolute quality. In a standards-based system, students' work is compared to established standards by means of a rubric based on that standard.

Teachers grow professionally as they “defuzz” their notions about good student work and put those notions into words. Writing a rubric is difficult for teachers because they have rarely thought about how they would describe what they expect in a student's response to an assignment. Guidelines for writing good rubrics include:

- Make sure there is a balance between process and content.
- The points should be equidistant—the difference between a 2 and 3 is the same as the difference between a 3 and 4.
- Scoring a 4 should be within the reach of all students.
- The criteria should be aligned with expectations as expressed in the (state) assessments.

Specifying quantities is easy but superficial. The rubric should not use quantities—it doesn't specify a number of errors at each score level. We are moving away from “countable” quantities to descriptions of quality.

Describing expected quality is the heart of standards-based schooling. Teachers are nervous about words such as “easily,” “confidently,” “clearly,” “thorough,” “compelling,” but these are words that describe the high quality we are looking for. They think these words are too “subjective,” and therefore difficult to defend to students and even parents. However, the recognition of quality is necessary if students are to be brought up from basic achievement to higher levels. Teachers must be able to recognize “a clear, logical explanation” and show

examples of it to students. Such notions cannot be quantified or counted, but they are the essence of high achievement.

Keep it impersonal. To keep the rubric in a constructive form for students and teachers alike, refer to "student work" rather than "students." This shows you are scoring an assignment, not the student's general achievement level.

This is a "subtractive" process. Start with a 4 and work down. In our experience, when directed to write first what level 4 work looks like, the groups usually write a description that would work for a "3" paper: they make a list of what must be in the student work. In the case of the "dots," this means a correct answer, and an explanation of how the student arrived at it. This is work that is perfectly adequate and shows understanding of the problem, but it lacks the confidence and clarity of "4" level work, besides having no reference to the role played by Marcy as recipient of the explanation.

Between the "3" answer and the "2" answer there is an important watershed. A "3" or a "4" answer display command of the concepts. Clearly the student knows and can apply the skills and knowledge, although the "3" lacks the confident ease of a "4." But work that earns a "2" or a "1" according to the rubric needs reteaching. The student doesn't understand the concept or hasn't offered any written explanation. Work that receives a "2" or a "1" needs reteaching, but clearly to a different degree.

Grading is a system-level decision, and will not be discussed here.

Standards in Practice™ **Step 5**

Using the rubric developed, score the student work.

■ Procedures

1. Conceal students' names on the assignment and designate them with letters; e.g., "Assignment A." A team should look at a complete set of student work responding to the assignment, not just samples.
2. Create a chart that lists the number of participants across the top and letters designating student assignments down the side. This will be used so that each participant can fill in his/her score for each assignment. The chart offers an "at-a-glance" look at the amount of agreement in the group.
3. Distribute the student work.
4. Ask each participant to score the student work ALONE, first, using the rubric you've worked out together.

5. When everyone has a set of scores, record them on a chart and reconcile them so that each team member roughly agrees.

■ Guidelines

Teachers should complete this step independently first, and then share ideas with others.

If you can't get complete agreement, at least decide between the papers that get a 4 or 3, and those that get a 2 or 1. (Scores of 1 or 2 indicate a need for reteaching.)

■ Key Points

Individual scores come first. Teachers must commit to the scores individually before they try to reach consensus. Use a table for this purpose. If scores aren't written down, it is too easy to change them as it becomes clear that some scores seem out of line with those of other group members.

When reaching consensus, use discussion to probe deeply on differences of opinion.

The team must then reach consensus on a score for each paper. Discussing differences in scoring produces some valuable conversation, because teachers reveal the differing value systems that underlie their grading and scoring. By using a common rubric based on standards, teachers begin to realize the need for common reliable grading systems.

Beware of grading on a curve. The issue of grading on the curve frequently arises during Step 5, when participants are tempted to give a higher score to papers that exhibit more accomplishment than others, although they do not meet criteria for a 3 or 4. The facilitator should facilitate a discussion about this, so participants are aware of this tendency and commit to avoiding the "bell curve" trap. It is perfectly possible that the majority of students may receive a 3 or a 2; in fact, it is more likely than a traditional bell curve. The ideal would be all 4's.

Use the rubric as the basis of discussion. Scores must be justified from the description in the rubric. Giving a higher score to a paper that is neater but not accurate is yielding to norm-referencing.

Don't fall into the trap of thinking that longer essay answers mean more proficient work. The best work often contains succinct, efficient explanations.

Standards in Practice™ Step 6

Analyze student work to plan strategy for improving students' performance. Then look at actions needed at the classroom, school, and district levels, to ensure that all students meet the standards on this and similar assignments.

■ Procedures

1. Ask about the qualities of the assignment: is it well-aligned with standards? Is it worth the students' time? Are our expectations high enough? If it needs adjusting, how should it be reworded? Additional criteria for good assignments include:
 - Instructions should be given in writing and should have all the information the student needs to respond.
 - The assignment should be focused on apply important concepts and essential skills in the appropriate standards.
 - They should include writing, even in math.
 - They should have a real-life application, if possible.
2. Look closely at the student work and make notes on what are the most frequent and fundamental problems.
 - For example, if students are attempting a math problem, can they read it? Do they know what they are asked to produce? Do they lack computational skills, or problem-solving techniques? Then build an instructional strategy—using the collective wisdom of the group—to tackle these problems.
 - Could the problem be related to other assignments in the unit? You may need to look at the overall unit construction to make sure that skills build upon one another.
3. Look at the entire unit of study to see how the collection of assignments is organized and sequenced.
 - Are these assignments enough, as a collection, to move a student toward mastery?
 - How can we make sure there is a strong link from standards and standardized assessments to assignments to scoring to instruction?
4. Look beyond this specific unit and generalize it into professional development at the school and district level:

- At the school level, should teachers meet across grade levels (vertically) to coordinate their teaching, for example?
- At the district level, could the district provide some special materials, for example? Or organize professional development?

■ Guidelines

Teachers focus primarily on the classroom level, even just on revising the assignment. Help them to think about how the whole school could improve students' skills, and how the central office (district) could provide assistance, if asked, especially in finding sources of deeper content knowledge. Probe deeply at each step. You may need to coach participants to think thoroughly about implications for the assignment, the instruction, and the teacher. Suggestions should be offered and received in a collegial, constructive environment.

■ Key Points

In Step 6, the team answers the question: what are we going to do about it? This is the most important step in the process. People tend to think they're done when they've got the work scored, but in fact all that was just preparation for answering the most important questions.

This process should ensure continuous progress. As groups meet regularly and teachers share experience and strategies, team participants will become increasingly comfortable in pushing each other towards excellence.

It is important to leave enough time for this discussion to go deeply into the process. The objective of the process is to produce change, and change thrives on visualizing possibilities. They can develop in Step 6 if there is enough time.

Think about what needs to happen at the school and district level as well as in the classroom for students to be successful.

Ask participants to analyze the student work for insight into students' thinking processes and to evaluate the students' knowledge and skills as a baseline for changes in instruction.

Focus the discussion on what needs to happen TOMORROW to enable students to succeed.

Collaborative Assessment of Student Learning (CASL)

The CASL process combines elements of action research, assessment, study groups, and Cognitive Coaching (Costa & Garmston, 1994). Together, teachers analyze student work samples and document their findings about the relationship between teaching and learning in a portfolio. In the process, teachers develop a richer repertoire of teaching strategies and deepen their content knowledge.

Key components. The CASL system is built upon three key components:

1. A culture of inquiry
2. Phases of inquiry into students' learning
3. Written analysis and reflection upon both the students' and the teachers' progress

1 Identify challenging areas. Teachers identify a target learning area from the standards that is particularly challenging for their students. This may be done by examining test data, test items, or school improvement plans.

2 Analyze student work. At the first CASL meeting, analyze the responses of an entire class on a given assessment or assignment. The responses are divided into three levels of performance: demonstrating target performance, approaching target assignments, performing below target performance.

3 Analyze findings. Record findings on a grid. Group students according to learning patterns – common misconceptions, strengths, gaps in knowledge, interests or learning styles.

4 Choose focus students. Identify two students as “focus students.” These students should represent different instructional challenges. These students are used as the “case studies” for the entire school year. This process will allow teachers to make generalizations about instructional methods based on their analysis.

5 Meet every two weeks to examine the work of the focus students. The CASL group then begins the collaborative process by examining a piece of student work. The learning is guided by a set of probing questions (see below). Each session results in a set of short-term goals and suggested strategies based on the analysis of the group.

6 Document your learning. Teachers are asked to provide written documentation of their students' progress, their analysis of student learning, and their own professional learning. The CASL portfolio includes (1) a description of the target learning area and each student studied; (2) the whole class and individual student work that was collected and analyzed; (3) the teachers' reflections and analysis from each study group session; and (4) their final reflections.

Guiding Questions: Setting the Stage

What guides your analysis of the student work?

Describe the student

- Provide a description of all the relevant characteristics of the student: age, gender, learning style, culture, interests, strengths, and any other important information that will help your colleagues understand your analysis.

Describe your objectives

- What learning objectives (skills, knowledge, attitudes) were you hoping to observe in this piece of work?
- What were your reasons for selecting these objectives?
- How do these goals/objectives fit in with what has been taught already?

Describe the experiences that led to this work

- What learning experiences did this student engage in prior to producing this work?
- What were your reasons for choosing this particular teaching/learning approach?

Describe your reasons for assigning this task

- What were your reasons for choosing this approach for assessing your student's progress (through the student work)?
- Under what conditions was this work generated (e.g., directions, group size, homework)?

Guiding Questions: Looking at the Work*Describe what you see in the work*

- What do you see in the student's work? (Use only descriptive words and withhold judgment.)
- What additional questions do you have as you look at the work?

Guiding Questions: Analysis/Interpretation*What does the work tell you about your student's accomplishments and your teaching?*

- What does the work tell you about your student's accomplishment of the learning goal(s) and the understanding of the particular information presented?
- What specific evidence can you provide for your assessment of what the student understands or can do (e.g. misconceptions, gaps in their knowledge base) or is like?
- What does this work tell you about how the student learns? What characteristics of the child might be influencing the work (e.g. development, interests, prior performance/experience, culture, attitudes)?
- What does this piece of work tell you about the success of your teaching approach?
- What factors in or outside the classroom may have influenced the student's performance (e.g., illness, playground conflict, family issues, time of day)?

Guiding Questions: Future Teaching Actions

Based on your analysis, what will you do next?

- Describe the teaching actions you might try next (Hypothesis)
- What are some of the teaching actions (e.g., teacher feedback, peer instruction, clearer modeling of expected work) you think are likely to help the student achieve the objective, and why do you think each would work?
- What additional information, if any, do you need before you can decide which action to take?
- Where will you get the additional information?
- Which of the actions described are you likely to try next with the student to help him or her accomplish the specified learning objectives? Why do you think this approach will help move the student toward the objectives?

Guiding Questions: Action

What did you try and how did it work?

- Describe what you did next and analyze how it went.
- Return to step 2 and begin the process again.

From Goff, Loretta, Amy Colton, and Georgea Mohlman Langer, "Project uses student work analysis to improve teaching." *Journal of Staff Development*; Fall 2000 (Vol. 21, No. 4). www.nsd.org/library/publications/jsd/goff214.cfm

Teacher Commentary

What	<p>Feedback to students that lets them know how the student's "evidence" matches up against the expectations expressed in the standards. It may be oral or in writing, and both are suggested.</p> <p>Teacher commentary is formative in nature; it tells the student how to improve (and assumes that s/he will have opportunities to do so!)</p>
Why	<ul style="list-style-type: none"> ➤ To correct knowledge gaps or skill deficits ➤ To provide feedback that is specific and helpful to the student ➤ To encourage the student to continue trying ➤ To guide learning by letting the student know where s/she needs to focus. ➤ To keep a written record of student progress.
When	<p>There are no hard-and-fast rules about how often you should include teacher commentary in your feedback to students. Common sense says that it is impractical to expect that every piece of work would have detailed commentary; on the other hand, if teacher commentary is only provided at the end of a unit, it doesn't offer much opportunity for the student to learn and improve! Here are some general guidelines.</p> <ul style="list-style-type: none"> ➤ Often enough to document progress throughout a unit ➤ Often enough so that students can make adjustments and learn and then demonstrate new learning. ➤ Often enough so that students can see patterns in their work and in the commentary their work elicits.
How	<p>First, review the standards and elements so that you have expectations clearly in your mind, and so that you can refer to them (in terms students understand) in your commentary.</p> <p>Center your comments around the standards and elements. If the teacher commentary is in writing, think of it as a "written conference."</p> <p>Be very specific; this helps students know exactly what their doing right and/or wrong.</p>

Indicators of Achievement: Instruction

1. Instruction aligns directly with standards.
 - Instructional strategies and learning activities are strongly aligned with the goals and performance standards for student learning.
 - The school consistently reviews and aligns instructional practices with the performance standards for student learning on an ongoing basis.
 - Classroom goals and performance standards are aligned with state standards.
 - The design and sequence of lessons or units of study take into account an understanding of any prerequisite relationships that exist among concepts and/or skills students are expected to achieve.

2. Essential understandings, concepts and key skills of the topics being studied are the main focus of learning activities.
 - Essential knowledge and skills are identified and given priority.
 - The design and selection of instructional strategies and learning activities for students are based on the essential knowledge and skills for student learning.

3. Teachers routinely employ instructional strategies found in replicated research studies to be highly effective, such as identifying similarities and differences, summarizing and note-taking, generating and testing hypotheses, using cues, graphic representations, Essential Questions, and advanced organizers.
 - Students are provided with learning opportunities that enable them to make connections between what they are learning and the world beyond the classroom and to apply their learning in addressing real-life problems.
 - Students are provided with opportunities to apply their learning in meaningful contexts that call for decision-making, investigation and problem solving.
 - Teachers place an emphasis on both the essential knowledge and skills for student learning and higher-order thinking skills to enhance students' understanding of information and ideas by involving students in synthesizing, generalizing, explaining, hypothesizing or arriving at conclusions that produce new meaning and understanding for them.
 - Teachers challenge students to research underlying causes, explain their thinking and/or justify a position.
 - Students are provided with instructional overviews that describe the relationships between past and present learning to increase the depth and breadth of their learning.
 - Students engage in substantive discussions about the content of the lesson/unit with the teacher and/or their peers, extending their knowledge and understanding of the essential concepts or skills.

- Examples and/or metaphors incorporated in the presentation of new content are carefully selected to enhance students' understanding of the new concepts or skills.
4. Teachers routinely collaborate on ways to improve student engagement in classroom activities and on assessments. Instructional strategies and learning activities are strongly aligned with the goals and performance for student learning.
- Significant time during the work week is provided to staff members for joint learning and collaborative work.
 - Professional development activities are aligned with the specific goals and instructional programs of the school and promote a focus on student learning.
 - The priorities of the design of professional development programs are based on a careful analysis of student performance data and the school's goals for improving student learning.
 - The school's professional development program helps administrators and teachers attain and develop the content knowledge and pedagogical skills necessary to design and deliver high-quality curriculum.
 - The school's professional development program prepares teachers to use research-based teaching strategies to support students' achievement of the essential knowledge and skills for learning.
 - Research-based content serves as the core of staff learning (i.e., an emphasis is placed on strategies that have proven valuable in increasing student learning and development).
 - The school's assessment system yields feedback that is part of a continuous improvement process for individual student performance and the overall instructional program.
5. Students have an opportunity to learn rigorous content with appropriate time allocated for learning and access to additional support beyond the classroom. Instructional strategies and learning activities are strongly aligned with standards.
- Students are provided with opportunities to receive additional individualized assistance that addresses the specific learning challenge(s) the student has encountered (e.g., assistance provided by a teacher or classroom aide, a peer tutor and/or from interactive technology-based instructional resources aligned with the curriculum).
 - If the results of formative assessments of student learning indicate that students are experiencing difficulties in their learning, students are provided with alternative strategies and additional support to help them learn the essential skills and concepts they are expected to achieve.
 - Information technology resources are effectively used to establish collaborative networks of support inside and outside the school to assist students in achieving the essential knowledge and skills for their learning.

6. Teachers define and communicate clear performance expectations and focus to students in advance.
 - Performance standards employed in the evaluation of student achievement are understood by all those who have a stake in the results of the assessment.
 - The expectations for student learning are clearly defined in terms of explicit performance indicators and standards that describe the vision of academic success for all students.
 - Clear explanations of new concepts or skills are provided to students (i.e., the teacher's oral and written language is clear and the choice of vocabulary is appropriate for the students).
 - The presentation of new content is provided with sufficient thoroughness to enable students to explore connections and relationships that can enrich and extend their understandings of the concepts and skills they are expected to learn.
 - The essential knowledge, skills and performance standards for student learning are shared and explained to parents and students in clear language, free of jargon or technical terms.
 - A shared vision of successful student learning is developed by providing models and exemplars so that teachers, parents and students know what good performance looks like.

7. A variety of instructional strategies are used including a mixture of individual study, whole class and small groups, as appropriate.
 - Teachers provide a balance of whole-class and small group learning activities to expand opportunities for students to achieve.
 - Teachers provide instruction that involves frequent interactions with students.
 - The assigned tasks or projects for small group activities are appropriate to the instructional goals of the lesson and take into account the typical developmental characteristics of the students' age group.
 - The selection of students who are assigned to work together as a group reflects careful attention to establishing the mix of strengths and needs represented by the students in the group.
 - Decisions about the use of individual or group accountability are made prior to the assignment of small groups.
 - Students are provided with instruction on how to work effectively in small groups (i.e., in addition to learning how to support and increase each others' learning in small groups, students learn teamwork, how to give and receive criticism, and how to plan, monitor and evaluate their individual and joint activities).

8. Teachers maximize the use of instructional time.
 - Teachers maximize students' academic engaged time by aligning instructional goals with strategies, resources (e.g., textbooks, instructional materials, etc.), learning activities and assessments of student learning.
 - Transitions between instructional activities and classroom routines for handling instructional materials and supplies occur smoothly with minimal loss of time.
 - Teachers and administrators protect learning time and allocate appropriate amounts of time for instruction.

9. Teachers routinely differentiate instruction for individual students based on their progress toward learning goals, interests and learning styles.
 - Teachers employ a variety of instructional techniques and strategies to adapt lessons to individual students or small groups, based on the analysis of the students' learning needs.
 - Learning activities and homework assignments are carefully developed to ensure that the learning tasks are challenging, but not frustrating for students to complete. Appropriate adjustments are made to accommodate students' learning needs.
 - Instruction provides frequent and timely formative assessments of students' learning progress to inform both teachers and students when or if additional time or alternative learning strategies are needed to support student learning.
 - Students' individual learning problems or misunderstandings are identified in the early stages of the learning process and additional support is provided. Alternative instructional strategies or learning activities are employed to meet the learning needs of students in achieving the essential knowledge and skills for their learning.
 - The scope and pacing of lessons is appropriate to the students.

10. Teachers act as guides and facilitators of student learning and create environments where students are actively engaged in learning, making some choices and taking responsibility for learning.
 - Students are frequently given the opportunity to make choices from a selection of well-designed activities aligned with instructional goals.
 - Students are provided with feedback on their learning that is accurate, constructive, substantive, specific, and timely, and that clearly informs them of the next steps to take in their responsibilities as learners to achieve the expectations for their learning.
 - Effective classroom management and organizational strategies are employed, and both academic and behavioral expectations for students are clearly defined.

11. Teachers encourage student reflection, self-assessment and self-adjustment by providing students with an opportunity and a format by which to assess their own work against pre-established criteria.
- Instruction involves the teaching of learning strategies to help students monitor and manage their own learning (e.g., help students become aware of their own thinking, self-assess and regulate their actions, demonstrate adaptability and flexibility, and persevere in completing challenging tasks).
 - Teachers carefully frame questions that enable students to demonstrate their level of understanding of the new content and that elicit students' reflection on their learning.
 - The performance indicators of the essential knowledge and skills for student learning describe the type of evidence and critical attributes of students' achievement of the goals for their learning.
 - Students can describe the expectations for their learning in their own words.
 - The clarity of performance standards enables students to self-assess their progress in achieving the standards.
 - Assessment practices include a process of continuous feedback for students on how they can improve their own learning.

Source of Indicators: Fitzpatrick, K. A. (1998). School-wide Indicators of Quality: A Research-Based Self-Assessment Guide to Schools Committed to Continuous Improvement. Indicators of Schools of Quality, Vol. I. Schaumburg, IL: National Study of School Evaluation.

Recommended Readings/Viewings: Instruction

Note: A more general list of resources for the standards-based education process is contained in the materials for Day one of training.

Examining Student Work. Alexandria, VA: ASCD, 2002.

This excellent resource includes four VHS tapes and a Facilitator's Guide that thoroughly illustrate a number of collaboration protocols for examining student work in order to improve student achievement. One set of these materials is being sent to each local system.

Hayes Jacobs, Heidi. *Mapping the Big Picture: Integrating Curriculum and Assessment K-12*. Alexandria, VA: ASCD, 1997.

In this step-by-step description of the process for creating and working with curriculum maps from data collection to ongoing curriculum review, Jacobs discusses the importance of "essential questions," as well as assessment design that reflects what teachers know about the students they teach. The benefits of this kind of mapping are obvious for integrating curriculum. Through the development of curriculum maps, educators can see not only where subjects already come together but also any gaps that may be present.

Literacy Across the Curriculum: Setting and Implementing Goals for Grades Six through Twelve. SREB, 2004.

This volume is essential for state, district, and school leaders who plan to implement school wide literacy programs. It provides concrete, research-based steps not only to raise reading and writing achievement but also to help students learn more in every class by using literacy skills. The guide focuses on five literacy goals: reading 25 books across the curriculum; writing weekly in all classes; using reading and writing strategies; writing research papers; and taking rigorous language arts classes.

Marzano, Robert J., Debra J. Pickering, and Jane E. Pollock. *Classroom Instruction That Works: Research-Based Strategies for Increasing Student Achievement*. Alexandria, VA: ASCD, 2001.

Using a meta-analysis of thousands of research studies, Marzano, et al., clearly answer the question, "Which instructional techniques are *proven* to work?" They provide 13 proven strategies that all teachers can use, and they explain the research in a clear, practical manner.

Marzano, R., et al. *A Handbook for Classroom Instruction That Works*. Alexandria, VA: ASCD, 2001.

A perfect resource for self-help or school study groups, this handbook makes it much easier to apply the teaching practices outlined in *Classroom Instruction That Works*. The authors guide the reader through the nine categories of instructional strategies that are most likely to maximize student achievement and provide everything needed to use the strategies quickly in classrooms. The book includes the following: exercises to check understanding; brief questionnaires to reflect on current beliefs and practices; tips and recommendations to implement the strategies; samples, worksheets, and other tools to help plan classroom activities; and rubrics to assess the effectiveness of the strategies with students.

Marzano, Robert J. *Classroom Management That Works: Research-Based Strategies for Every Teacher*. Alexandria, VA: ASCD, 2003.

The authors analyze research from more than 100 studies on classroom management to answer the questions, "How does classroom management affect student achievement?" and "What techniques do teachers find most effective?" The authors provide action steps, along with real stories of teachers and students, to guide teachers in implementing the research findings.

Strong, R., H. Silver, and M. Perini. *Teaching What Matters Most: Standards and Strategies for Raising Student Achievement*. Alexandria, VA: ASCD, 2001.

This practical book about the responsibility educators have to teach what matters most includes many examples of educators throughout the nation who have been successful in increasing student performance on state and national assessments. The authors also explore three changes that must take place to achieve this goal: responsible standards, responsible strategies, and responsible assessment practices.

Wiggins, Grant, and Jay McTighe. *Understanding by Design*. Alexandria, VA: ASCD, 1998.

This book explains the “backward design” process that is the backbone of standards based education. The book explains both the underlying principles and the process teachers can use to put them into practice.

Wiggins, Grant, and Jay McTighe. *Understanding by Design Study Guide*. Alexandria, VA: ASCD, 2000.

This companion book to *Understanding by Design* provides discussion questions, graphic organizers, and summaries to support faculty study groups that are exploring *Understanding by Design*.

Wiggins, Grant, and Jay McTighe. *Understanding by Design Professional Development Workbook*. Alexandria, VA: ASCD, 2004.

This companion book to *Understanding by Design* is chock-full of templates and examples to help teachers put the process into place.

Suggested Web Sites for Instruction

<http://ims.ode.state.oh.us/ODE/IMS/Lessons/Default.asp>

This web site, created by the Ohio Department of Education, provides guidelines for planning standards-based instruction and for designing standards-based units and lessons.

<http://pareonline.net>

Practical Assessment, Research and Evaluation (PARE) is an on-line journal supported, in part, by the Department of Measurement, Statistics, and Evaluation at the University of Maryland. Its purpose is to provide education professionals access to refereed articles that can have a positive impact on assessment, research, evaluation, and teaching practice.

http://users.edte.utwente.nl/lanzing/cm_home.htm

This web site provides an overview of concept mapping that might be useful for determining those concepts and processes that fit together for units of instruction.

<http://www.greece.k12.ny.us/instruction/ela/6-12/BackwardDesign/Overview.htm>

This page on the Greece Central School District of New York web site offers multiple resources related to instructional planning using the Standards-Based Education process.

<http://www.greece.k12.ny.us/instruction/ela/6-12/Curriculum%20Mapping/Index.htm>

This page on the Greece Central School District of New York web site offers multiple templates that can be modified and used to assist in mapping concepts into units of instruction.

http://www.lkwash.wednet.edu/lwsd/html/programs/curriculum/modelunits_t.asp

This web site published by the Lake Washington School District includes a sample planning guide, a unit planning template, and several sample unit plans. GPS need to be unpacked through stages 1 and 2 before employing these templates.

<http://www.learn-line.nrw.de/angebote/greenline/lernen/downloads/nine.pdf>

This article lists, explains, and provides examples of nine instructional strategies, identified by Marzano, Pickering, and Pollock, that improve student achievement across all content areas and grade levels.

<http://www.pbs.org/pbsyou/about.html>

This PBS web site provides information about free televised, adult education courses in everything from dramatic literature to cooking. Anyone teaching a new course or just wanting to revisit particular content topics might find this site useful.

<http://www.rmcdenver.com/useguide/lessons/examples.htm?>

This site provides sample lessons/units based on the Texas state standards.

<http://www.sasked.gov.sk.ca/docs/policy/approach/instrapp05.html>

This excellent article from Curriculum and Instruction Branch Saskatchewan Education, 2220 College Avenue, Regina, Saskatchewan, provides information teachers may find helpful about matching instructional strategies to desired learning goals.

<http://64.233.179.104/search?q=cache:FWPY3QS1C6wJ:www.pls.uni.edu/tws/rubricsamples/IDM2.pdf+Making+Instructional+Decisions&hl=en>

This web site provides two anecdotal examples of teachers using assessment of student learning to make instructional decisions.

<http://www.techtrekers.com/>

This site provides information about simulations, web quests, and other strategies and activities that can provide students with the opportunity to learn.

www.pals.sri.com

PALS is an on-line, standards-based, continually updated resource bank of science performance tasks indexed via the National Science Education Standards (NSES) and various other standards frameworks.

www.teachersbridge.org

This excellent site, created by a consortium of Georgia educators and other professionals in education, provides teaching resources, online learning communities, and much more.

<http://www.sasked.gov.sk.ca/docs/policy/approach/instrapp02.html>

This article provides an overview of four foundations for instructional decision making, as well as information on appropriate teacher reflection about the practice of instructional decision making in the classroom.

Learning Journal

What squares with
my thinking?

What's still
rolling around
in my mind?

What do I
need to
change?

